

The observations made on that occasion will soon be published in the United States Monthly Weather Review of the Weather Bureau. Unfortunately, they do not sensibly increase our knowledge of the oblique arcs of the anthelion, whose mode of production remains obscure. By examining closely what has been stated by Bravais, Mr. Besson has determined that he can account for only the short arcs, deviating a little from the anthelion upward, but not at all for those which extend as far as the region of the sun. It is very desirable that at their next appearance the oblique arcs of the anthelion be observed with more precision and more detail than previously. A photograph, especially in the case of short arcs, will be the most instructive document. If the arcs are long, it will be proper to give attention to the following points:

Are these true arcs of the circle, or, in other words, is their curve uniform and, in this case, what is their radius of curvature?

What is the angle between them at their point of crossing over the anthelion?

At what distance from the zenith do they pass?

At what point of the sky do they recross?

Is this exactly on the sun?

It is indispensable to note the exact time when the observation was made, for the character of the phenomena must vary with the height of the sun.

Mr. Lemoine thinks that it would be advantageous, in the study of halos, not to confine ourselves to observation, but to consider also methods of experimentation. With the present resources of our laboratories we can reasonably produce artificially various crystalline forms of ice and study their optical properties.

Mr. Besson says that he shares entirely the opinion of Mr. Lemoine, and that he has never neglected an opportunity to point out to physicists and to laboratory crystallographers the experimental study of the crystallization of ice as an interesting and certainly profitable study, but up to the present time he has not succeeded in interesting any one who possessed the necessary equipment.

On the other hand, he took occasion to remark that, in the study of halos, observation and experiment each has its own domain—the first alone can make known to us the natural phenomena to be explained; the second is for the purpose of teaching us the various possible forms of ice crystals and showing us which can best account for the optical appearances.

Mr. Goutereau recalls that Mr. Besson, in his researches on halos, had recourse to experimentation to determine the orientation that ice crystals take in falling.

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HALOS IN FEBRUARY, 1914.

The following report by Daingerfield of the halo seen on February 6, 1914, at Pueblo, Colo., and again the reports by Flora, Holcomb, and Judy of the halo seen on February 24, 1914, in Kansas, are reprinted from the respective Monthly Section Summaries by request of Prof. C. F. Talman, as referring to rarer forms of halos and of interest to students of halo phenomena.—[C. A.]

REMARKABLE HALO AT PUEBLO, COLO., FEBRUARY 6, 1914.

Mr. L. H. Daingerfield, Local Forecaster, Pueblo, Colo., sends a report and drawings of a remarkable solar halo observed at that place between sunrise and 9 or 9:30

a. m., February 6, 1914, by Mr. W. F. Doertenbach, Mr. J. K. Sweeny, and himself. The phenomenon included a complete and brilliantly colored halo of 22° radius around the sun, part of a fainter halo of 46° radius, a complete parhelic circle, a brilliant circumzenithal arc, parhelia of 22° and 46° , and a sun-pillar forming a cross with the parhelic circle. Fragments of another heliocentric halo, described as about 66° from the sun, with paranthelia at their point of intersection with the parhelic circle, are also mentioned in the report. As these arcs do not agree in position with any known form of halo and as the report states that "the color may have been altogether white," it seems possible that these were fragments of the halo of Hevelius (the 90° halo).

One of the drawings (none of which are reproduced) sent by Mr. Daingerfield shows the circumzenithal arc forming a complete circle, also an arc of a halo of about 22° radius, prismatically colored, surrounding the point opposite the sun in azimuth, as well as certain other features that do not correspond with any forms of halo heretofore recorded. It also shows four paranthelia, two at the point of intersection of the small halo opposite the sun with the parhelic circle, and two on the parhelic circle about 60° from the antisolar point. This drawing appears to be a composite of the observations of several persons.—[C. F. T.]

UNUSUAL SOLAR HALOS SEEN IN KANSAS ON FEBRUARY 24, 1914.

Solar halos of unusual appearance were observed in eastern, northern, and central Kansas on February 24, 1914, from 9 a. m. to 10 a. m., and sun dogs (parhelia) of considerably more than usual brilliancy were seen from

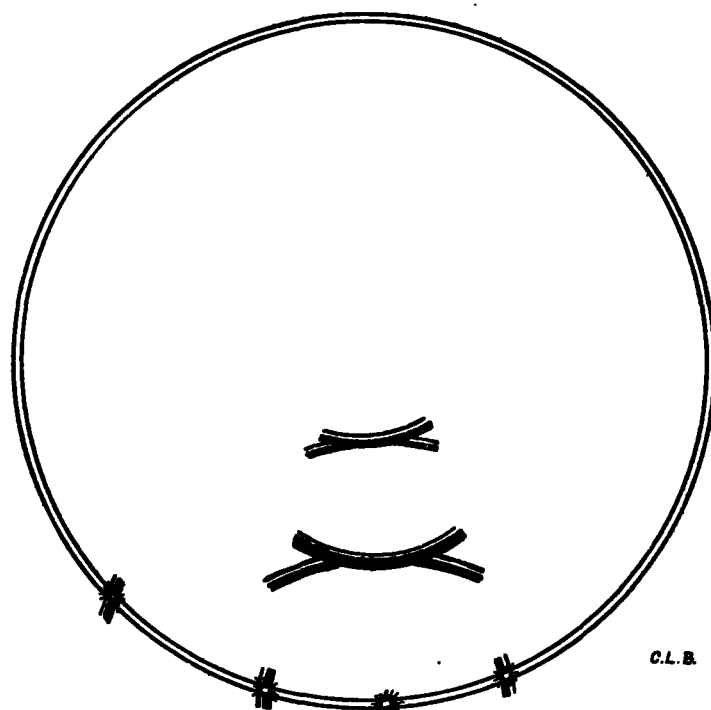


FIG. 1.—Solar halos seen at Topeka, Kans., February 24, 1914, between 9:30 and 10 a. m. (90th meridian time).

4 to 5:30 p. m. of the same day over the northern and central portions of the State.

From the meager descriptions received it is believed that halos reported at Hoxie, Kans., Beloit, Wis., Minneapolis, Minn., and Council Grove, Kans., were similar in

a general way to those at Topeka, Iola, and Garnett, Kans., descriptions of which appear in this article. Over this area, extending more than 250 miles west and 75 miles south of Topeka, the halos were observed at practically the same hour.

The territory covered by the stations reporting either two or three brilliant sun dogs (or parhelia) in the late

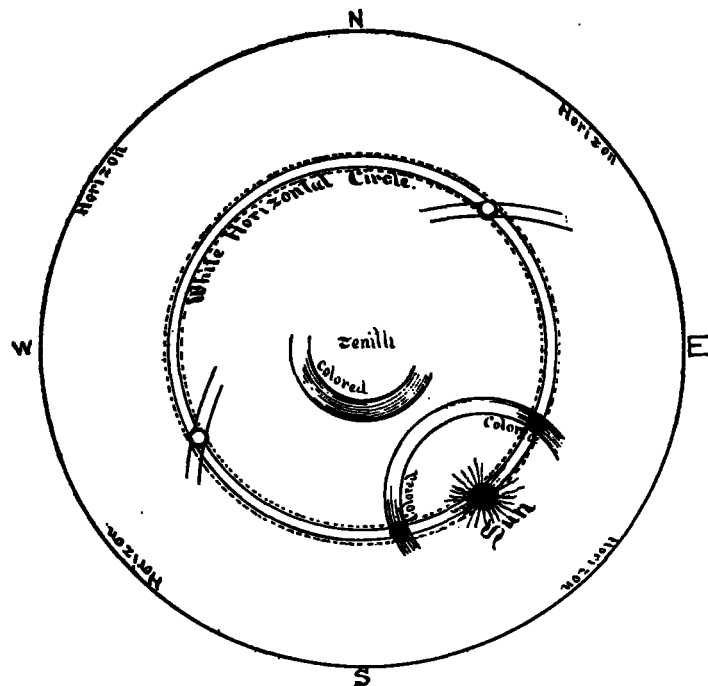


FIG. 2.—Solar halos seen at Iola, Kans., February 24, 1914, between 8:30 and 11:25 a. m. (90th meridian time).

afternoon was fully as extended and, as in the case of the halos, the sun dogs were observed at the same hour at all stations reporting them.

THE SOLAR HALOS AS SEEN AT TOPEKA.

By S. D. FLORA, Observer, Weather Bureau.

At Topeka the halos consisted of the segments of four bright halos and three sun dogs or parhelia in prismatic colors, and a white circle that extended entirely around the sky at the altitude of the sun. They were first noted at 9:30 a. m. and had mostly disappeared by 10 a. m. [90th mer. time]. (See fig. 1, p. 271.)

Two very bright sun dogs about 5° long appeared on each side of the sun at about 22° distance from it. The white circle extended horizontally through the sun dogs and the sun. It was sharply defined for about 100° on the outside of each sun dog, but could scarcely be distinguished between the sun dogs and the sun and in that part of the sky opposite the sun. The third sun dog appeared in this white circle about 46° to the northeast of the sun.

Two intersecting halos appeared 23° above the sun and two more 46° above it. The one nearest the sun was about 40° long and, if extended as a circle, would have passed around the sun just outside the sun dogs. The second prismatic halo was turned convexly to the sun and overlapped the first just above the sun. It was only 30° long, but was the brighter of the two, and this made the longer halo, the one turned with its concave side to the sun, have at first appearance the shape of the bow generally shown in the pictures of Cupid. The segment of

the halo turned convexly to the sun seemed to indicate that this halo, if complete, would have been elliptical.

The two halos 46° above the sun were arranged and colored similarly to the ones at 23° distance, but each was only about half as long.

In each halo that the spectrum colors appeared the reddish tints were on the side nearest the sun. By 10:00 a. m. only the sun dogs were visible and these disappeared by 11:00 a. m.

The sky during this time was partly covered with a veil of cirro-stratus clouds so thin that they gave it a milky rather than a cloudy appearance except just a few places where the clouds were plainly apparent. Most of the halo formation appeared where the clouds were thin.

THE SOLAR HALOS AS SEEN AT IO LA.

By H. K. HOLCOMB, Observer, Weather Bureau.

A complete circle of white light, two incomplete solar halos, and four mock suns were observed from 9:15 a. m. to 11:25 a. m. [90th mer. time], February 24, 1914, at this station. (See fig. 2.)

Portions of the above phenomenon were observed as early as 8:30 a. m. and gradually disappeared between 10:30 and 11:25 a. m. The large, complete circle of white light, parallel to the horizon, at the altitude of the sun, was the most conspicuous part of the phenomenon. There

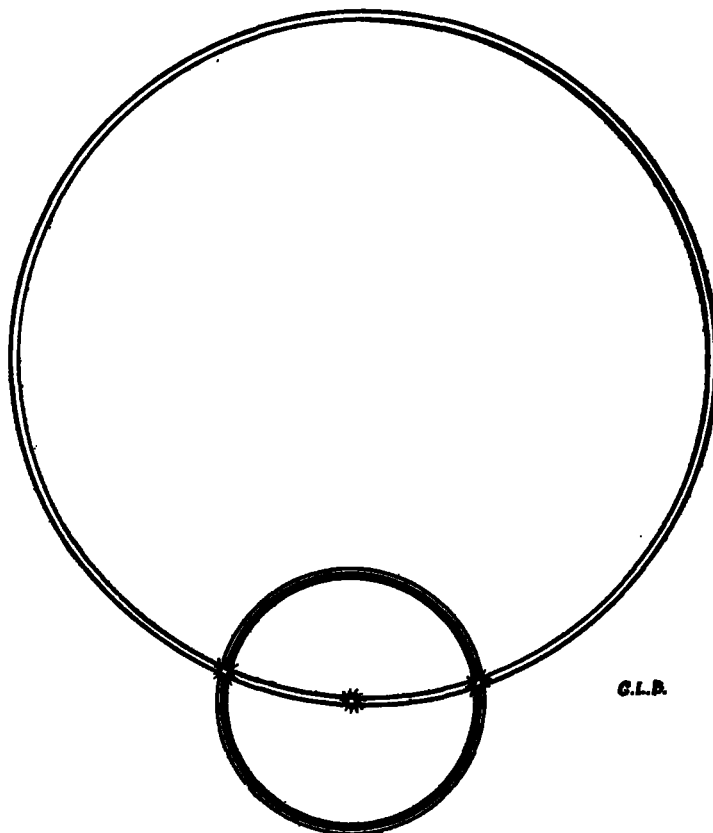


FIG. 3.—Solar halo seen at Garnett, Kans., February 24, 1914, at 9:30 a. m. (90th meridian time).

was an incomplete solar halo of 22° radius, and another very faint solar halo of 90° radius. Where these halos crossed the ring of white light mock suns were produced. The inner halo and the two mock suns were well defined and colored with red on the inner side, blending with orange, yellow, green, blue, and vanishing with purple on the outer side. Nearer the zenith another similarly col-